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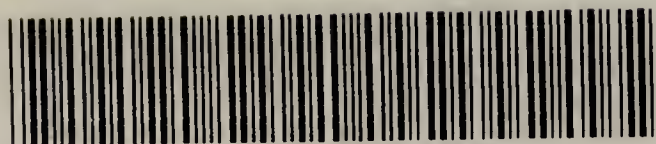


THE MOUNT VERNON HOSPITAL,
NORTHWOOD,
MIDDLESEX.

STATISTICAL REPORT
FOR
1932.

MARCH, 1933.

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Statistical Report.

March, 1933.

TREATMENT OF MALIGNANT GROWTHS OF THE UPPER JAW.

By Douglas Harmer and Stanford Cade.

Growths of the upper jaw may develop in the bone or its periosteum, in the membranes lining the antrum or other cells, or may start extrinsically in the nasal fossæ, postnasal space, orbit or mouth.

Owing to their deep situation the clinical diagnosis of these tumours is difficult and in many instances impossible. Also the symptoms may be so indefinite that the patient does not suspect the possibility of serious disease or consult a doctor until late. In practice, therefore, it must be remembered that most of the cases when they apply for treatment, either because they have not taken advice soon enough or from failure of the doctors to diagnose the true state of affairs, must be classed in the borderline group, many of them are frankly inoperable and a few only early and operable.

Growths involving the maxilla are nearly always malignant, but they vary greatly in type, more so than in any other part of the body. Ewing has described thirty-seven different forms in the antrum alone. They can be considered under three groups:—

(1) *Carcinomas*.—By far the commonest; types very variable, usually squamous celled, often undifferentiated; difficult to distinguish from meso-blastic forms. Nearly all of them are highly malignant, tending to invade and destroy neighbouring structures, to produce visible swellings of the face, orbit, side of head, palate or naso-pharyngeal fossæ; to recur rapidly after incomplete removal, but for some unexplained reason rarely to disseminate either to the glands of the neck or to distant organs until far advanced: usually seen in males over forty.

(2) *Sarcomas*.—May occur at any age, in either sex, and in any form, from the most virulent rapidly growing types to those that are practically innocent; tending to cause more definite symptoms than the carcinomas and to disseminate easily.

(3) *Endotheliomas*.—Almost as common as sarcomas; seen at any age in females and males; fairly consistent in type; growing very slowly and usually encapsuled; disseminating late, often after many years, but very prone to recurrence locally after simple excision.

Such then is a brief outline of the growths in this situation, and naturally it is always difficult to decide the best treatment for each case. We have to consider many points:—

Diagnosis.—Biopsy is advised in most cases. The fragment should be removed with as little disturbance as possible, for preference after a short course of external irradiation. It seems generally agreed that there is a danger of dissemination of the disease to deeper parts through the vessels and lymphatics. To prevent this Diathermy should be employed. Unfortunately, negative histological reports are common and often cause dangerous delays; if malignant disease is strongly suspected the surgeon must decide the best treatment and disregard the pathologist's report; he must not consent to repeated small operations—unfortunately, this rule is constantly broken—rather he should see if by some other means a fairly certain diagnosis can be made.

Transillumination.—Most growths produce a dense shadow over the affected side, sometimes confined to one part of the antrum.

X-rays.—Often of little value, as visible bone changes occur late; in the case of the antrum the injection of lipiodol before radiography may reveal filling defects and be helpful.

Exploration.—If after examination of the symptoms and signs the condition is suspicious it must be explored forthwith. No delay is excusable. First the antrum is punctured and may contain discharge which is rather thin and indefinite, smelly, and

sometimes blood-stained ; any unusual amount of bleeding is significant, especially in an elderly patient who has never had previous trouble with his antrum. No attention should be paid to a negative result. It is better to open up a healthy antrum through the incisor fossa than to overlook a growth while it is still intrinsic. Sometimes the general inflammation may even now over-shadow the growth, and again a biopsy may be indefinite. This places a very serious responsibility on the surgeon, and until an exact test for cancer is available, many of these cases, a larger proportion than is generally recognised except by those who are working in cancer clinics, must be treated while in such an embryonic stage as to be labelled of doubtful malignancy: otherwise some of them will develop metastases in the liver, lungs, or any part of the body, and lives may be lost because the doctor is afraid to state a diagnosis which instinctively he knows to be correct and the patient unwilling to face the position because of this hesitation.

Treatment.—There are three main methods, namely Surgery, Diathermy and Irradiation.

The purpose of this report is to emphasise that experience has accumulated in the last ten years to show that these growths are so variable in type that no surgeon can undertake to treat them properly unless he has all three methods at his disposal. To remove a rapidly growing round cell sarcoma by surgery alone is a useless and dangerous treatment. And one can go much further and say that those of us who have had sufficient experience of “upper jaws” have come to the conclusion that surgery and, to a less extent, diathermy are by themselves unsatisfactory because of the high ratio of local recurrences. We prefer not to balance these three treatments one against the other, but to employ them all in different combinations according to the nature of the case. And it must be admitted that the main point of this thesis is to emphasise that growths in the jaw cannot be safely treated without radiation and in most cases patients must go to special cancer clinics for the purpose.

For years past the details of our treatment have been constantly modified, but a fairly constant method has gradually been evolved:—

(1) Growth suspected:—A short course of X-rays is given over three or four days. This amounts to about one-third of a full course of high voltage X-rays and usually causes a distinct shrinking of the neoplasm, rarely of inflammatory conditions.

(2) Biopsy.—When a definite diagnosis is obtained the decision as to treatment is much easier and depends on the type.

(3) If the tumour is a round celled sarcoma or an anaplastic carcinoma cutting is avoided if possible, as the best treatment seems to be high-voltage X-rays with or without radium (surface or bomb), or interstitial needling in some cases. If surface irradiation alone is advised the patient must be sent to an institution which possesses a high current X-ray apparatus and a large amount of radium.

In all the experimental centres of the world there is a growing tendency to use higher voltage machines and larger doses of radium for surface treatments.

(4) If the tumour proves to be a spindle celled or fibro-sarcoma or a squamous celled carcinoma with cell nests or adeno-carcinoma or endothelioma, Surgery and Diathermy are indispensable, because it is at present very difficult to deliver an adequate dose to such growths which are so deeply situated by surface treatment alone. It has been found that complete removal of the upper jaw is no longer necessary or advisable. As most of the growths are complicated by sepsis the first essential is to provide adequate drainage and this can be obtained by removal of the hard palate and alveolus on the affected side or in very localised tumours by making a free opening through the incisor fossa. Such openings also give free access to the growth, whether situated in the antrum, in the nasal fossa or in the other accessory sinuses, such as the ethmoids or sphenoid, but not to the frontal sinus. The visible part of the tumour can easily be removed through

such an opening by diathermy without great risk of dissemination. Later the outlying malignant cells which are always present in the bony structures surrounding the cavity can be treated by irradiation. Whether it is advisable to remove the greater part of the growth in this way or to rely on rays only is a question which depends on the virulence of the disease. In slowly growing low grade tumours such as fibro-sarcomas it is certainly advisable. But in very cellular types it may be safer to treat them by irradiation before removing them surgically.

Several methods are employed:—

(1) Interstitial Radium treatment:—Radium needles of 22 mm. overall length containing 1 mgr. each, with platinum filtration of 0.8 mm., can be inserted uniformly into and around the tumour. Longer needles containing 2 mgr. and of similar linear intensity can be used if the growth is large and extends very deeply into the nares. Needles can also be inserted through the nose into the nasal fossa when this is involved by growth, or needles can also be inserted through the skin around the orbit deeply into the ethmoidal cells using long needles which reach far backwards into the sphenoid or postnasal space when necessary.

As a rule about 20 mgrs. of radium are required and with adequate filtration, such as 0.8 mm. of platinum, the radium can be left in position for a week with little fear of necrosis, owing to the free drainage.

(2) Surface Irradiation:—For this method of treatment a dental plate is made, the lower part consisting of vulcanite and containing a layer of lead to protect the tongue and the mouth from unnecessary irradiation; the upper part of soft dental stent material which is moulded to fit all parts of the cavity accurately. Upon the surface of this stent radium needles of different lengths are laid on, containing 0.5 to 1 mgr. each with the same filtration—employing in all 15 to 20 mgr. of radium. The plate is now inserted into the cavity and can be worn daily until the adequate dose of from one to two thousand milligram hours has been delivered. In practice it has been found that the best results are obtained if split doses are given. That is to say the plate is worn for periods of two hours only night and morning. Using a total of only four hours daily the treatment has to be continued for seven to ten days to deliver an adequate dose. At the end of the treatment the growth (if not removed) should have shrunk greatly and the whole cavity should be covered with a thick yellow film.

The advantage of this slow method in preference to larger amounts of radium used continuously for a short period is that it can be given more safely, with less fear of serious inflammation of neighbouring structures; the patient can wash out the cavity frequently, thus preventing sepsis and necrosis; the effect upon the disease can be watched from day to day, thus helping the surgeon to determine the dose that is required, and the final results are better.

As before, outlying needles can be inserted through the skin, into the nose or into the soft palate far back if necessary. Or later on supplementary treatment with X-rays or “bomb” can be given.

These two methods are now exclusively employed and it is claimed that it is unnecessary to mutilate the patient by external incision through the skin of the face and that nothing is gained by removal of the jaw. They have the great advantage that they are slighter undertakings, cause no deformity and yet produce results that are superior to the other methods. After the growth has been destroyed the opening in the palate can easily be closed by a well-fitting plate which is easily worn and allows the patient to speak and feed normally. A further point of great importance is that the permanent opening in the palate allows the cavity to be inspected easily, so that at any time if there is any remnant of disease or recurrence this can be destroyed by diathermy or further irradiation.

In our hands the method has been employed for over ten years with safety and very little distress to the patients. The results have undoubtedly been better than those formerly obtained by surgery or diathermy alone. The prognosis depends on the nature of the disease. When dealing with the highly malignant sarcomas and carcinomas one can confidently expect at least 50 per cent. of good primary cures and about 30 per cent. of long-standing results. In this group the patients who succumb usually die, not from local recurrences, but with distant metastases in other parts of the body.

Carcinomas of the ordinary squamous celled types are also very malignant and are very prone to recur locally rather than to metastasize, even when treated thoroughly by irradiation, so that the prognosis is perhaps even worse than in the group mentioned above. But life may be prolonged for several years even with extensive growths.

Slowly growing tumours, such as endotheliomas, fibro-sarcomas, etc., have a better prognosis and quite 50 per cent. can be cured for very long periods. Even recurrences can often be treated successfully.

Summary.

Malignant growths of the upper jaw are usually very malignant and show a great tendency to local recurrence but metastasize late. For these reasons they can rarely be cured by surgery and diathermy alone.

The best method of treatment would appear to be—

- (1) Preliminary high-voltage X-rays, not a full course.
- (2) Biopsy.
- (3) Fenestration of hard palate. (This provides good drainage, free exposure of the tumour. The cavity can be inspected at any time and early recurrences of disease detected. It causes no deformity.)
- (4) Removal of the greater part of the growth and thorough irradiation of the cavity followed by further external irradiation if necessary.
- (5) Remnants of growth can be destroyed by diathermy or in rare instances a second course of radiation treatment can be given.
- (6) Removal of sequestra.
- (7) Complications are rare and there should be no operation mortality. Occasionally the eye may be destroyed. Serious burns are not often met with. As a rule no treatment of the glands of the neck is required.
- (8) Prognosis depends upon early diagnosis and the type of disease.

(Reference—Treatment of Malignant Disease of the Upper Air Passages by Irradiation. Harmer, W.D., Semon Lecture. John Murray, 1932. St. Bartholomew's Hospital Reports.)

TABLE I., 1932.

A TABULAR STATEMENT SHOWING THE CONDITION ON DECEMBER 31st, 1932,
OF ALL CASES TREATED AND DISCHARGED FOR THE FIRST TIME IN 1932.

Site.		Disease.	Methods of Radiation and Other Treatment.		Total.	Male.	Fe- male.	Alive.	Dead.
			Primary Growth.	Lymph Areas.					
LIP		Sq. Carc.	I.	S.	8	7	1	8	
		" " ..	I.	I.	2	2		1	1
		" " ..	I.		1	1		1	
					11	10	1	10	1
TONGUE	Anterior	" " ..	I.	S.	2	2		2	
	Middle	" " ..	I.	S.	2	2		2	
	"	" " ..	I.		2	2			2
	"	" " ..	I.	B.	1	1		1	
	Posterior	" " ..	I.	I. SX.	1	1		1	
	"	" " ..	I.		1	1			1
	"	" " ..	Nil	Nil	1	1			1
					10	10		6	4
	Recurrent	" " ..			3	3		3	
		Adenoma	I. SX.		1		1	1	
FLOOR OF MOUTH		Sq. Carc.	I.	S. I.	2	2		2	
		" " ..	I.	S.	1	1		1	
ALVEOLAR MARGIN		" " ..	I.		1		1	1	
		" " ..	S.		1		1	1	
		" " ..	I.	S.	1	1		1	
		" " ..	SX. S.		1	1			1
		" " ..	SX. I. S.		1	1		1	
					5	3	2	4	1
BUCCAL MUCOSA		" " ..	I.	I. S.	1	1		1	
PALATE		" " ..	SX. C.		1		1		1
TONSIL		" " ..	I.	I.	1	1			1
		" " ..	SX. I.	S.	1	1			1
		" " ..	SX. I.		1	1		1	
		" " ..	C.	S.	1	1			1
		" " ..	SX.	SX.	1	1		1	
					5	5		2	3
PHARYNX		" " ..	SX.		1		1	1	
PYRIFORM FOSSA		" " ..	Tracheotomy ..	S.	1	1			1
		" " ..	Nil	Nil	1	1		1	
POST CRICOID		" " ..	SX. I.		1		1		1
		" " ..	SX.	S. I.	1	1			1

Figures in heavy type are the summation of the numbers in the immediately preceding category.

Symbols used to Denote Methods of Treatment.

C Cavity.
H Heyman Technique.
I Interstitial.
IO Interstitial through wound.
IAbd Interstitial *via* Abdomen.
IRad Interstitial of Breast and Lymph areas.
SX Deep Therapy.

Amp. Amputation.
B Block Dissection.
D4S Treatment with Lead Selenide.
E Excision of Growth.
POP Post Operative Prophylactic Radiation.
S Surface with Radium.
Rn Radon.

TABLE I., 1932 (continued).

Site.		Disease.	Methods of Radiation. and Other Treatment.		Total.	Male.	Fe- male.	Alive.	Dead.
			Primary Growth.	Lymph Areas.					
PAROTID TUMOUR		Malignant ...	I. ....	.....	1		1	1	
CERVICAL GLANDS	Secondary	Sq. Carc....	.....	.....	5	4	1	3	2
ESOPHAGUS		" " ...	SX. ....	.....	3	2	1	1	2
		" " ...	SX. S. ....	.....	1		1	1	
		" " ...	SX. C. ....	.....	1	1			1
		" " ...	Nil. ....	.....	1	1			1
					6	4	2	2	4
MOUTH	Recurrent	" " ...	I. ....	.....	1	1		1	
BUCCAL MUCOSA		Papilloma ...	I. ....	.....	1	1		1	
GALL BLADDER ...		Carc. ....	.....	.....	1	1			1
APPENDIX		"	E. ....	.....	1		1	1	
RECTUM		"	C. ....	.....	1	1		1	
		"	Colostomy. C. ...	.....	2	2		1	1
		"	C. Colostomy	.....				
		"	C. E. I. ....	.....	1	1		1	
		"	Colostomy. I. ...	.....	2	1	1	1	1
		"	E. ....	.....	3	1	2	3	
					9	6	3	7	2
ANUS		Sq. Carc. ...	Colostomy. I. ...	S.	1	1		1	
NASAL FOSSA	Tumour	Nature ?	SX. I. ....	.....	1	1		1	
		Sq. Carc. ...	SX. C. ....	.....	1		1	1	
	Recurrent	" " ...	I. ....	.....	1		1	1	
ETHMOID		Sph. Carc....	SX. ....	.....	1		1	1	
ANTHUM		Sq. Carc....	E. C. I. ....	.....	1	1		1	
LARYNX	Extrinsic	" " ...	S. Fenestration I.	.....	1	1		1	
	Recurrent ....	" " ...	.....	.....	2	1	1	2	
MEDIASTINUM ...		Sarcoma ? ..	SX. ....	.....	1		1	1	
LUNG		Neoplasm ...	S. ....	.....	1	1			1
		Actinomycosis	S. ....	.....	1		1	1	
BREAST		Sph. Carc....	I.	I.	11	1	10	10	1
		" " ...	I.	I. S.	2		2	1	1
		" " ...	I. S.	I. S.	11		11	10	1
		" " ...	I. S.	I.	4	1	3	4	
		" " ...	SX. I. S.	I. S.	2	1	1	2	
		" " ...	S.	S.	3		3	3	
		" " ...	SX. Rad Amp.	.....	1		1		1
		" " ...	Rad Amp. S. ...	.....	6		6	6	
		" " ...	Amp. I.	I.	1		1	1	
		" " ...	E. I. S.	I.	1		1	1	
					42	3	39	38	4

Figures in heavy type are the summation of the numbers in the immediately preceding category.

Symbols used to Denote Methods of Treatment.

C	Cavitary.	Amp.	Amputation.
H	Heyman Technique.	B	Block Dissection.
I	Interstitial.	D4S	Treatment with Lead Selenide.
IO	Interstitial through wound.	E	Excision of Growth.
IAbd	Interstitial via Abdomen.	POP	Post Operative Prophylactic Radiation.
IRad	Interstitial of Breast and Lymph areas.	S	Surface with Radium.
SX	Deep Therapy.	Rn	Radon.

TABLE I., 1932 (continued).

Site.		Disease.	Methods of Radiation and Other Treatment.		Total.	Male.	Fe- male.	Alive.	Dead.
			Primary Growth.	Lymph Areas.					
BREAST (Continued)	Palliative	Sph. Carc....	I.	I.	1		1	1	
			I.	I. S.	1		1		1
			S. I.	S.	1		1	1	
			S.	S.	4		4	3	1
			SX.	SX.	1		1	1	
			Nil.	Nil.	1		1		1
					9		9	6	3
	Prev. Operation	,, ,, ...	POP. S.	POP. S.	16		16	14	2
			POP. SX.	POP. SX.	1		1	1	
	Recurrent	,, ,, ...			19		19	16	3
	Sec. Glands	,, ,, ...			4		4	4	
VULVA.....		Sq. Carc....	I.		1		1	1	
			I.	B.	1		1	1	
			I. S.		1		1		1
			S.	SX. B.	1		1		1
			I.	SX.	3		3	3	
					7		7	5	2
VAGINA		,, ,, ...	I.	S.	1		1		1
			I. SX.		1		1		1
	Sec. Glands	,, ,, ...		SX.	1		1	1	
CERVIX		Sq. Carc....	H.		30		30	25	5
			H.	SX.	13		13	11	2
			C.		10		10	6	4
			C.	SX.	1		1	1	
			Nil.	Nil.	1		1		1
					55		55	43	12
	Recurrent	,, ,, ...	I.		1		1	1	
CORPUS		Simple	C.		1		1	1	
			C.		19		19	19	
			Curretting		1		1	1	
			C.		1		1	1	
			H.	SX.	1		1	1	
OVARY.....	Recurrent	Sarcoma	C.	SX.	1		1	1	
	,,	Adeno-Carc	C.	SX.	1		1	1	
		Papilliferous- Carc.	E.	SX. S.	1		1	1	
UTERUS	40 years and over	Irregular Hæmorrhage		SX.	1		1		1
	Under 40 years	,, ,,	C.		2		2	2	
	Fibroids	,, ,,	C.		5		5	4	1
	,,	,, ,,	E.		1		1	1	

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Symbols used to Denote Methods of Treatment.

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H Heyman Technique.
I Interstitial.
IO Interstitial through wound.
IAbd Interstitial *via* Abdomen.
IRad Interstitial of Breast and Lymph areas.
SX Deep Therapy.

Amp. Amputation.
B Block Dissection.
D4S Treatment with Lead Selenide.
E Excision of Growth.
POP Post Operative Prophylactic Radiation.
S Surface with Radium.
Rn Radon.

TABLE I., 1932 (continued).

Site.		Disease.	Methods of Radiation and Other Treatment.		Total.	Male.	Fe-male.	Alive.	Dead.
			Primary Growth.	Lymph Areas.					
UTERUS (Continued)		Chorion-Epithelioma	C. I.....	SX.	1		1	1	
		Mucous Polyp.	C.....		1		1	1	
	Various				2		2	2	
PROSTATE		Carc.	SX.		1	1		1	
		„	I. SX.		1	1			1
PENIS		Sq. Carc....	I.	S.	1	1		1	
	Recurrent ..	„ „ ..	I.	S.	1	1		1	
	Sec. Glands....	„ „ ..		S.	2	2		2	
	„ „	„ „ ..		SX.	1	1		1	
TESTIS	„ „ ..	Carc.		Nil	1	1			1
BLADDER		„	I.		5	4	1	4	1
		„	SX.		1	1			1
	Recurrent	„	I.		2	2		1	1
	Sec. Glands....	„		S. SX.	2	1	1	1	1
SKIN		Rodent Ulcer	I.		4	4		4	
		„ „	S.		1		1	1	
		„ „	Nil ..		1		1		1
		Epithelioma	I.		3		3	3	
		„	I. S.		2	2		2	
		„	I.	S.	2		2	1	1
		„	S.		1		1	1	
		„	E. S.		1		1	1	
		„	SX. I. S. I.		1		1		1
		„	E.		1		1	1	
		Hæmangioma	I.		1		1	1	
		„	S.		1	1		1	
		Melanoma ...	E. I.		1	1		1	
	Sec. Glands....	Sq. Carc....	S. E.		1	1		1	
VERTEBRAE	Round Cell	Sarcoma	I.		1	1		1	
FEMUR	Spindle	„	S. I.		1		1	1	
CHEST AND NECK	Lympho—	Sarcoma	S.		1	1			1
		Lymph-adenoma	SX.		2	1	1	1	1
KIDNEY	Spindle	Sarcoma	E. S.		1		1		1
VARIOUS	Recurrent	„			5	5		2	3
CEREBRAL TUMOUR...	Radiation only at Mt. Vernon...				8	3	5	6	2
MISCELLANEOUS ...					31	8	23	29	2
					383	108	275	311	72

Figures in heavy type are the summation of the numbers in the immediately preceding category.

Symbols used to Denote Methods of Treatment.

C	Cavitary.	Amp.	Amputation.
H	Heyman Technique.	B	Block Dissection.
I	Interstitial.	D4S	Treatment with Lead Selenide.
IO	Interstitial through wound.	E	Excision of Growth.
IAbd	Interstitial via Abdomen.	POP	Post Operative Prophylactic Radiation.
IRad	Interstitial of Breast and Lymph areas.	S	Surface with Radium.
SX	Deep Therapy.	Rn	Radon.

TABLE II.
TONGUE (all Cases).

Year.	Interval since Treatment.	Total.	Alive.	Dead.	Not Traced.
1930	2 years	16	2	14	
1931	1 year	17	6	11	
1932		8	5	3	

TABLE X.
RECTUM (all Cases).

Year.	Interval since Treatment.	Total.	Alive.	Dead.	Not Traced.
1930	2 years	17	2	15	
1931	1 year	8	2	6	
1932		9	7	2	

TABLE XX.
CARCINOMA OF BREAST.
All Cases (untreated when first admitted).

Year.	Interval since Treatment.	Total.	Alive.	Dead.	Not Traced.
1930	2 years	46	26	20	
1931	1 year	55	30	25	
1932		51	44	7	

TABLE XX. A.
CARCINOMA OF BREAST.
PALLIATIVE TREATMENT AND NO TREATMENT
CASES EXCLUDED.

Year.	Interval since Treatment.	Total.	Alive.	Dead.	Not Traced.
1930	2 years	45	28	17	
1931	1 year	47	28	19	
1932		42	38	4	

TABLE XX. B.
CARCINOMA OF BREAST.
INTERSTITIAL RADIATION OF BREAST AND
LYMPHATIC AREAS.

Year.	Interval since Treatment.	Total.	Alive.	Dead.	Not Traced.
1930	2 years	23	11	11	1
1931	1 year	*14	5	9	
1932		11	10	1	

* 1 Case has passed into Table XX C.

TABLE XX. C.
CARCINOMA OF BREAST.
INTERSTITIAL AND SURFACE RADIATION OF
BREAST AND LYMPHATIC AREAS.

Year.	Interval since Treatment.	Total.	Alive.	Dead.	Not Traced.
1930	2 years	10	7	3	
1931	1 year	20	14	6	
1932		19	17	2	

TABLE XXV.
CARCINOMA OF CERVIX.
All Cases (untreated when first admitted).

Year.	Interval since Treatment.	Total.	Alive.	Dead.	Not Traced.
1930	2 years	41	15	26	
1931	1 year	53	29	24	
1932		55	43	12	

TABLE XXV. B.
CARCINOMA OF CERVIX.
ALL CASES TREATED BY RADIATION.

		INTERNATIONAL DEGREE.													
Year.	Interval since Treatment.	1		2		3		4		Total.		Not Radiated.		Not Traced.	
		Alive	Dead.	Alive.	Dead.	Alive.	Dead.	Alive.	Dead.	Alive.	Dead.	Alive.	Dead.		
1930	2 years	5	2	5	5	4	9	1	9	15	25		1		
1931	1 year	4	—	8	6	15	9	2	9	29	24				
1932		8	1	6	1	15	2	14	7	43	11		1		

THE PATHOLOGICAL DEPARTMENT, 1932.

THE work done in the Pathological Laboratory in 1932 consisted of the examination of specimens from operating theatre, wards and staff, and of post-mortems.

The numbers under these headings were:—

Specimens from theatre, wards and staff.....	676
Daily urine tests for the wards.....	1049
Post-mortems	32

Specimens from theatre, wards and staff were made up as follows :—

Histological.....	299
<i>Blood counts.</i> Staff	167
„ „ Wards	87
Urine, special tests.....	19
Fluids and exudates	14

Blood.

Chemical and Bacteriological	13
Serological (sent away)	29
Blood (various), gastric contents, swabs and sputums	48

Total	<u>676</u>
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A special examination of all irradiated tissues collected during the preceding two years was made, in order to determine the local reaction of living tissues to irradiation and the conclusions upon this subject were published in the Journal of Pathology and Bacteriology, Vol. XXV., 1932, under the title “Causes of Cell Death in Irradiated Human Tissue.”

B. D. PULLINGER.

THE DEPARTMENT OF PATHOLOGICAL RESEARCH, 1932.

MISS Goulston continued her researches here under a grant from the British Empire Cancer Campaign until her return to Australia in April, 1932. The results have been published in three papers:

(1) On the technique of exposing the chorio-allantoic membrane of the chick embryo for experimental purposes. *Brit. J. Exp. Path.* 1932. XIII. 175.

(2) The action of beta radiations from radium on the chorio-allantoic membrane of the chick embryo. *Brit. J. Exp. Path.* 1932. XIII. 317.

(3) The increase in the fragility of the red blood corpuscles after exposure to radium. *Brit. J. Radiol.* 1932. V. No. 58,775.

The first two papers have an important bearing on Moppett's work on the differential action of X-rays on the chick embryo, and show, that in the first place unless special precautions are taken to protect the eggs from bacterial infections, changes in the allantoic membrane will occur, precisely similar to those described by Moppett as being due to radiation, and, secondly, that the hypertrophic changes following radiation and injury by bacteria, are not primary reactions but secondary to injury and of the nature of repair.

Miss Goulston's work on the fragility of red cells, showed that this was increased by large doses of β radiation, whereas gamma radiation given in very large doses had only a slight action.

Four others papers have been published from the Laboratory during the year:—

(1) On the effect of anæmia on the reactions of the skin and of tumours to radium exposure, in conjunction with Dr. Eidinow. *Brit. J. Surgery.* 1932 XIX. 75,481. Our experiments showed that the bleeding of rats immediately before radiation renders the skin and the tumour, Jensen's Rat Sarcoma, less sensitive to β radiation than normal skin or tumours in unbled animals. This is in keeping with the low sensitivity to radiation of anæmic patients.

(2) Some blood examinations of X-ray workers, *Brit. J. Radiol.* 1932. V. 50. 156. These blood examinations of X-ray workers at General Hospitals in London, show that good protection is being provided; no decided difference was found between X-ray workers, and other workers at these hospitals which served as controls.

(3) The action of radium on blood supply, The White Reaction. *Brit. J. Radiol.* 1932. V. No. 56,643. By inoculating Indian ink into rats bearing tumours which had

been radiated, it was found that in a few days after radiation the ink would not penetrate the radiated tumours, whereas it would penetrate into un-radiated tumours in the same animal. This obstruction in the blood vessels results in tumours appearing white and bloodless a few days after radiation and leads to, or is followed by, necrosis of the tumour cells. This indirect action on tumour cells must be added to the direct action in the destruction of living tumours by radiation.

(4) The life history of the nucleus and nucleolus and the effects of β radiation upon them. J. Roy. Med. Soc. 1932. LII. 362. For this research the nuclei of bean roots were used, because they are very large and their internal structure easily seen. The experiments showed that the evolution or growth of the non-dividing nucleus is inhibited at two stages by radiation : one stage at which the nuclei of resting cells are normally found, and the other not far removed in point of time from mitosis, at a stage when the nucleolus appears to be manufacturing chromatin, indeed, it appears that it is this manufacture of chromatin which is interfered with by the radiation, and that it is for this reason that the evolution of the nucleus is held up and that cells do not therefore pass into mitosis.

J. C. MOTTRAM,
*Director of Pathological Research,
Mt. Vernon Hospital and Radium Institute.*

THE X-RAY DEPARTMENT, 1932.

High Voltage Therapy Department.

No. of Patients Treated	114
„ „ Treatments Given.....	1904
„ „ hours during which the X-Ray Tubes have been working 649—6 $\frac{1}{4}$ mins.	

X-Ray Diagnostic Department.

No. of Cases for Examination.....	261
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Associated Departments.

Electrotherapy, Actinotherapy and Photographic Records.

Medical Diathermy, Ionisation, etc.	No. of cases	4
Ultra Violet Irradiation, etc. ...	„ „	9
Photographic	„ „	175

Technique.

Gynaecological group:—

All these cases have received X-radiation subsequent to treatment by radium, the time interval between the cessation of the radium treatment and the commencement of X-radiation has been within three months whenever possible.

The main objective in these cases has been to deliver to the lesion from 100 per cent. to 110 per cent. U.S.D., and in order to do this it has been necessary to administer a total surface dose of from 580 per cent. to 650 per cent. U.S.D. according to the habitus of the patient.

The physical factors used have been:—

A constant potential of 200.k.v. used to excite an X-ray tube, provided with pump-water-cooling, capable of passing a current up to 15.MA.

Filtration has been provided by 1.5.mm : Cu : and a focus-skin-distance of 40. Cm : has been employed.

The number of fields employed in the majority of cases has been four, and sometimes five:—

- (1) Anterior vertical. (20X20.Cm :).
- (2) Posterior „ „ (15X11.Cm :).
- (3) Right lateral vertical. (15X11.Cm :).
- (4) Left „ „ „ „
- (5) Perineal. „ (8X8 to 10X10.Cm :).

The average surface dose per field per session has been 45 per cent. U.S.D. with some necessary variation towards the end of the course, the anterior and posterior fields receiving extra doses of from 30 per cent. to 40 per cent. U.S.D. as these fields present the smaller surface lesion distance.

Daily treatments are given, Sundays excepted, one field being treated per day in the above order till the necessary dose has been given.

Lead lined applicators are used in all cases to secure compression, and so diminish the surface-lesion distance. In some cases, owing to the abnormal dimensions of the patient, it has been more advantageous to employ two posterior oblique fields in place of the one posterior or vertical.

In order to make use of these oblique fields, it is necessary to obtain a surface tracing of the cross section of the patient's body at the level of the os-pubis.

This is done by moulding a flexible metal strip to the patient's body, at the required level, which is then removed and a tracing made from it, from which the necessary measurements and location of the fields, together with the angle of incidence of the central ray can be worked out.

The area of these oblique fields is 11X15.Cm :

All depressions in the area of the field treated are filled with powder, in the form of bolus bags containing a mixture of Fuller's-earth and sodium-bicarbonate, made up to specific gravity 1.

Complete epilation (temporary) is obtained in all cases in areas treated, together with a varying degree of erythema, appearing within two weeks of cessation of treatment, followed by desquamation and pigmentation. There is usually some degree of radiogenic reaction present in the vaginal mucosa.

Radiogenic diarrhoea is almost a constant feature towards the end of the course, of varying degree of severity, and lasting for a week or ten days after treatment has ceased, but is seldom or ever of such severity as to require therapeutic measures.

Radiogenic vomiting has been absent in this group, and the most that any patient has complained of has been a slight feeling of nausea and some anorexia towards the end of the course, and this has been in spite of the rather large fields used, and heavy dosage, to the lower abdomen.

Whenever possible, each case has received a second course similar to the above within a period of three months.

Prostate and Bladder cases :—

The technique has been very similar to that used in the gynaecological group, with the exception that oblique posterior fields are used in all cases.

Upper air passages :—

The majority of these cases have received X-radiation prior to operative procedure, and, or, treatment with radium, and a few have received X-radiation subsequent to radium. Two cases have been treated by X-radiation only. The technique used has been as follows :—

Physical factors used have been a constant potential of 200.k.v. with filtration provided by 1.5.mm : Cu : and a focus-skin-distance of 40.Cm :

The face and neck have been treated as an open field, reaching from the upper or lower border of the orbit, depending on the position of the growth, down to the level of the clavicles, the head and thorax being protected by the necessary lead equivalent above and below these levels.

Six fields are selected, which, being open, overlap, and are as under :—

- (1) Right lateral vertical.
- (2) Left anterior oblique.
- (3) Left posterior oblique.
- (4) Right anterior oblique.
- (5) Right posterior oblique.
- (6) Left lateral vertical.

One field is treated per day, in the above order, receiving 30 per cent. U.S.D., till each field has had two doses, the whole course taking thirteen days, and the total surface dose being 360 per cent. U.S.D., which gives a uniform depth dose, to the lesion, of 100 per cent. U.S.D.

Slight variations in dosage are made to meet special requirements in certain cases.

Towards the end of the treatment there is obvious radiogenic reaction present in the mouth and throat, together with loss of salivary secretion, and resultant dryness of mouth and throat; and loss or perverted sense of taste is also complained of.

The interior of mouth and throat is frequently smeared and sprayed with liquid paraffin, which greatly diminishes resulting discomfort.

All hair bearing areas treated undergo complete temporary epilation.

In one week from the cessation of treatment all unpleasant symptoms abate, and by the end of three weeks the parts have returned to normal, with the exception of some dryness due to lack of saliva. Further treatment is given subject to individual requirements.

Breast cases :—

Cases in this group come under three headings :—

- (1) Untreated cases, where X-radiation is to be the only therapeutic measure.
- (2) Cases where X-radiation is given preliminary to operative measures.
- (3) Cases where X-radiation is given subsequent to operation.

Cases in which X-radiation is uncombined with any *other treatment* :—

In this type of case the glancing method is employed.

In using this technique, the patient is placed on the couch in the supine position, and the central-ray is projected at an angle approaching the horizontal, and forming a very acute angle with the chest wall. Applicators are used, with an aperture up to 20X15.Cm : according to size of breast.

The lower part of the cone is in contact with the chest wall at the extreme periphery of the breast, so that the central-ray passes through the breast in the region of the nipple from a lateral aspect. By this procedure the lower periphery of the cone of rays traverses a very superficial portion of lung, covering pleura, ribs, and emerges at the opposite side of the breast.

In this way a large portion of lung, lying beneath the breast, is protected from the necessarily heavy radiation which it would otherwise receive if vertical fields were used.

The angle formed by the base of the applicator and the breast, is filled up with bolus bags, thus rendering the lesion a deep one, and the dosage is calculated on the lines of a deep-seated lesion, the actual depth being measured.

The physical factors used are a constant potential of 200.k.v. with filtration provided by 1.5.mm : Cu : and a focus-skin-distance of 40.Cm :

Two, three, four, or five fields are selected, according to individual requirements, as under :—

- | | | |
|-----------------------|---|--------------------|
| (1) Internal glance | } | with use of bolus. |
| (2) External „ | | |
| (3) Superior „ | | |
| (4) Inferior „ | | |
| (5) Anterior vertical | | |

One field is treated per day, Sundays excepted, till a total surface dose of from 400 per cent. to 600 per cent. U.S.D. has been given, according to the size of the breast and extent of involvement.

Fields are treated in the order given above, with the exception of the anterior vertical field, which is reserved till the end.

The breast under treatment is made to project vertically from the chest, to as great an extent as possible, by means of bandages adequately arranged.

A well-marked erythema is obtained, usually within a week from the cessation of treatment, and marked shrinkage, and sometimes complete disappearance of the growth also obtains within this time.

After an interval of from two to three weeks following the above procedure, the supra and infraclavicular, and axillary regions receive full dosage.

The whole of the above technique is repeated within a period of three months.

Cases where X-radiation is given preliminary to *operative procedure* :—

The technique employed is exactly as in the preceding class, with the exception that the dosage is somewhat less.

Cases where X-radiation is given subsequent to *amputation*.

These cases come under four headings :—

- (1) Prophylactic treatment, where there is no evidence of disease.
- (2) Cases where only a very superficial area is involved, such as local recurrence in operation scar, or skin nodules, with no other evidence of disease.
- (3) Cases where there is definite induration in the operation area involving deeper structures, and perhaps glandular metastasis.
- (4) Cases where there is definite ulceration.

Cases requiring prophylactic treatment only :—

The operation area is treated as an open field, by a modified glance method.

The patient is placed on the couch in the supine position.

The field is marked out, and points are marked on it where the central ray is to be projected at each treatment, to insure uniform irradiation.

Usually two fields are selected :—

- (1) Internal glance.
- (2) External glance.
- (3) Anterior vertical (sometimes).

Daily treatments are given, one field per day receiving usually about 40 per cent. U.S.D., till the whole area has been uniformly irradiated to the value of 100 per cent. U.S.D.

Physical factors used are, a constant potential of 150.k.v. with filtration provided by 5.mm : Al : and a focus-skin distance of 40.Cm :

The supra and infraclavicular and axillary regions are irradiated in from two to three weeks later, using 180.k.v. and 0.5.mm : Cu : filtration.

Cases presenting a very superficial lesion only :—

The technique is as in the preceding group, except that in some cases 180.k.v. and 0.5.mm : Cu : is used for the breast area, depending on the degree of the lesion.

Cases where there is definite induration :—

These are treated as in the preceding two groups, except that sometimes, 200.k.v. and 1.5.mm : Cu : filtration is used, depending on the degree of the lesion, with additional dosage to an anterior vertical field.

Cases where there is ulceration :—

These cases are treated as in the last group, but at the conclusion of the treatment as described, the whole breast area is protected with lead, with the exception of the ulcerated area and a margin of skin of about $\frac{1}{4}$ in. which is then subjected to a further dose, sufficient to bring the value over this part up to from 110 per cent. to 130 per cent. U.S.D.

The result of this procedure to the ulcerated area is usually relief of pain, cessation of discharge and odour, and healing, if only temporary.

Carcinoma of the Oesophagus :—

These cases are diagnosed by X-ray examination and skiagrams, in conjunction with the oral administration of barium emulsion.

The exact position and degree of the lesion is noted.

The patient is placed on the treatment couch and an area extending from the level of the upper border of the sternum above to the cardiac orifice below, and extending 4.Cm : to the right and 5.Cm : to the left of the mid-line, is marked out on the patient's chest.

A corresponding area is marked out on the posterior aspect of the chest.

These two areas form the two fields used in the majority of cases, with an additional left lateral oblique field sometimes, when it is difficult to procure the necessary dose with the anterior and posterior fields only.

In some cases where the lesion is situated at the lower end of the oesophagus, it is possible to use an anterior superior oblique, and an anterior inferior oblique field, the latter being obtained by compressing the upper abdomen in to the angle formed by the approximation of the costal margins.

The possible fields are therefore :—

- (1) Anterior vertical (or oblique).
- (2) Posterior „
- (3) Left lateral vertical.
- (4) Anterior inferior oblique.

Daily doses are given, one field being treated per day, with from 20 per cent. to 30 per cent. U.S.D. till a total surface dose of from 250 per cent. to 450 per cent. U.S.D. has been administered, in a period of from ten to twenty days.

Physical factors used are, 200.k.v. with filtration provided by 1.5.mm : Cu : and a focus-skin-distance of from 60 to 90.Cm :

This abnormally large F.S.D. permits of relatively increased depth dose, and lessens the irradiation of the adjacent lung.

The above technique is repeated within a period of three months.

Periodic X-ray examinations are subsequently carried out, and treatment recommenced at the first sign of recurrence.

Bone Sarcomata :—

There are two main groups which modify X-ray treatment according to their situation :—

- (1) When situated in long bones of limbs.
- (2) When situated in other positions, *e.g.*, skull, pelvis, vertebræ, etc.

When situated in the long bones of limbs or elsewhere the exact position and extent of the growth is seen and estimated by X-ray examination.

Growths situated in long bones :—

The area involved is marked out on the skin with a very liberal margin above and below the extreme limits of the growth.

Wherever possible, four fields are used :—

- (1) Anterior vertical. (Centre A and B).
- (2) Posterior vertical. „ „
- (3) Internal lateral. „ „
- (4) External lateral. „ „

In cases where the long axis of the field exceeds 10.Cm : as is usually the case, the areas are sub-divided for purposes of centering the central ray, in order to secure uniform irradiation.

Thus, in the case of the anterior field, at the first treatment to this area, the central ray would be projected at point "A" and at the second dose to this field at point "B," and so on for all the fields.

The fields receive daily doses in the above order, one field being treated per day.

Dosage is extremely varied, according to the depth of the lesion, which may be in the lower forearm of a child of diameter 5.Cm : or in the upper thigh of a muscular man, of diameter 20.Cm :

In the former case the depth dose will closely approximate to the surface dose in value, whereas in the latter case the depth dose will only be about 38 per cent. of the surface dose.

In all cases wherever possible, the lesion receives 100 per cent. U.S.D.

The part to be treated is built up with bolus bags to the level of the upper surface of the field to be treated, thus forming the part into a solid block, and so securing uniform irradiation of the part, and additional scatter radiation from the bolus.

Physical factors used are :—

A constant potential of 200.k.v. with filtration provided by 1.5.mm : Cu : and a F.S.D. of 40.Cm :

A second course of treatment is given within three months.

Periodic X-ray examinations are carried out, and at the first sign of recurrence, treatment is recommenced.

The chest also receives periodic X-ray examination.

Cases where the growth is not in a long bone :

The technique depends entirely on the situation and environment of the growth.

The most advantageous arrangement of fields has to be worked out for each individual case, in such a way that the maximum dose may be administered to the lesion, with the minimum of damage to the neighbouring structures, which in some cases are vital ones. To accomplish this in some cases becomes an extremely difficult and complicated procedure.

In other respects the technique in these cases differs little from that used in the preceding group.

Dosage.

The method of dosage described in this report has been mainly "The intensive split dose method," but there is a modification of this method which has been employed in some cases.

This is the "Saturation method of dosage" and is carried out as follows :—

The intensive split dose method is followed as described, but at the conclusion of the dose, after a period of from a day or so to a couple of weeks, another dose, corresponding in value to the loss sustained by the fall in value with time, is given, thus bringing the dose back to the 100 per cent. U.S.D. value.

Again after another interval of days or weeks, as in the former case, another dose is given, once more bringing the U.S.D. up to 100 per cent. value, and so on for a longer or shorter period.

G. CRANSTON FAIRCHILD.

THE MOUNT VERNON HOSPITAL

32, FITZROY SQUARE, W.1.

22nd June 1933.

WITH SIR CUTHBERT WALLACE'S COMPLIMENTS.
